Lewis & Clark Expedition Monument at Monticello

by David L. Holland, LS

A team of surveyors will build a high-accuracy global positioning system (GPS) survey monument on the west lawn of **Monticello** to commemorate the 200th anniversary of the beginning of the **Lewis & Clark Expedition**. The *brass* monument is to be established as a lasting tribute to Thomas Jefferson's vision of exploring and mapping a new nation, and a special dedication will take place at Monticello on January 14, 2003. The position of the monument will be near the footpath on the west lawn. The monument will be surveyed at a point perpendicular to the west face of the Monticello residence, and opposite the center axis of the structure. The nature of the building location exercises for placement of the monument prompted Curt Sumner, ACSM Executive Director, to refer to the survey as "the ultimate house location survey."

Throughout time, mankind has always had a need to define where people, places, and things can be located on the face of the Earth. By the 1700s, the New World had been settled along the East Coast, and colonial surveying assumed an important role as the population increased. A sextant was used to determine latitude, and direction was established with a compass. Determining longitude was next to impossible because there was no way the correct time could simultaneously be read at the Greenwich Meridian and at the meridian of the observer.

↑ Curt Sumner (left) shares information about the monument survey with visitors to Monticello. Coincidentally, the gentleman he is talking to is the sculptor for the Lincoln Surveyor Statue Project initiated by the Illinois Professional Land Surveyors Association.

The lines of latitude and longitude form a geographic grid that land surveyors have traditionally used to determine location on the face of the Earth. Until quite recently, the exact locations of boundary points were often obtained using a theodolite, which turns a precise vertical angle to the sun or another star such as Polaris (the North Star), and by recording the precise time of sighting the celestial body. Today, surveyors rarely, if ever, use astronomic

↑ Alan Dragoo is supervised by Roy Anderson as he seeks favor from the GPS gods, while Dave Doyle (back to camera) leads the choir (Laura Krom of the Thomas Jefferson Foundation, Nancy Doyle, and Curt Sumner) in songs of praise.

"The Ultimate House Location Survey"

Dave Holland computes positions for the house corners of Monticello.

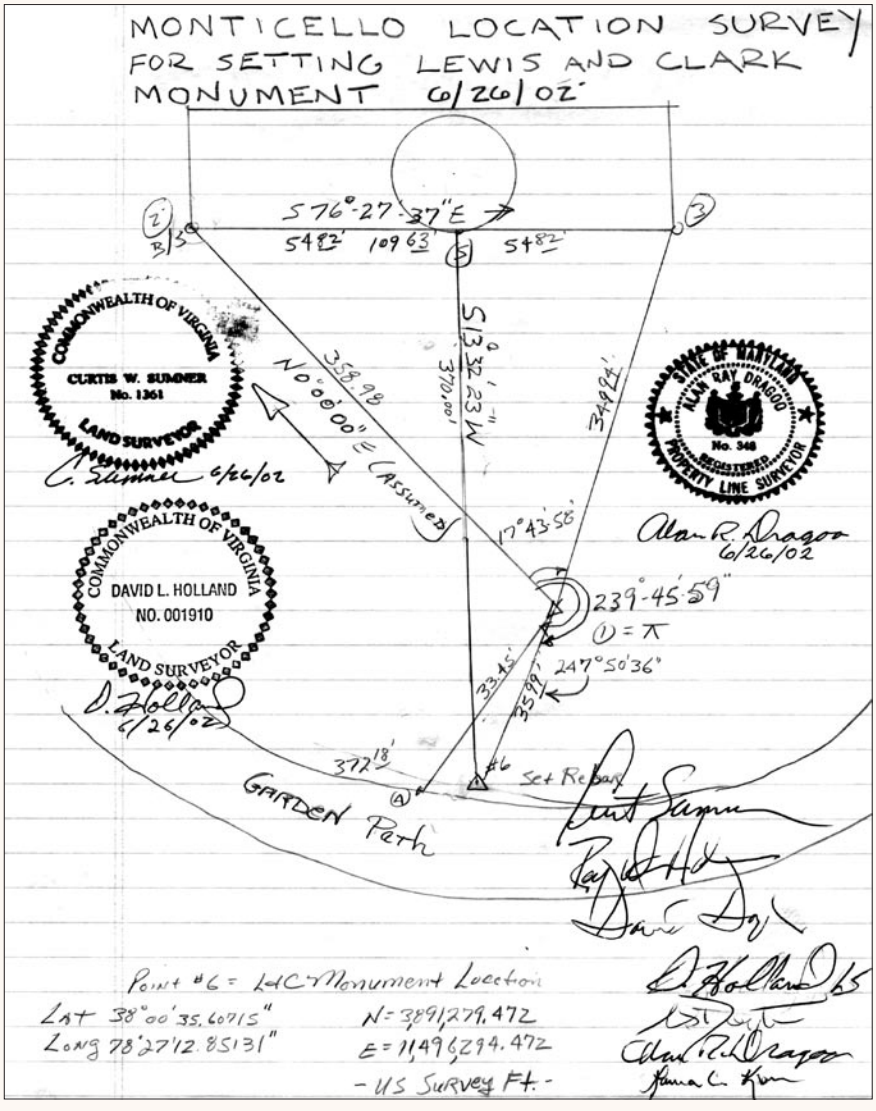
observations for latitude, longitude, or azimuth determination. They have GPS to locate desired points or objects.

The global positioning system was developed a few decades ago by the U.S. Department of Defense as a worldwide navigation and positioning resource for military purposes, and, eventually, for civilian use. The basis of GPS is a constellation of 29 satellites orbiting 12,000 miles above the Earth and logging 200,000 miles a day or over 8,000 miles per hour. The satellites, which act as reference points, transmit radio signals on two frequencies at the speed of light (186,000 miles per second). The signals are beamed to GPS receivers on Earth which "triangulate" the satellites' exact positions at given times. A GPS receiver determines its distance from each satellite by measuring the travel time of the signals transmitted from the satellites. When the receiver "knows" the distance from at least four satellites, it processes the beamed data and calculates its latitude, longitude, and altitude on the ground.

Because surveyors require measurements with centimeter accuracy, they use differential GPS to establish reference points on the ground. The technique is called "differential GPS," because it makes it possible to calculate the difference between the position of a second receiver established at a known point and the position calculated from the satellite data. This difference is the error in the GPS signal, and corrections are then calculated that offset the error. These corrections are applied

Roy Anderson, Dave Holland, Dave Doyle, and Curt Sumner with the GPS receiver at the spot where the commemorative monument will be placed.

← Survey crew for the "ultimate house location," (left to right): Nancy Doyle, Curt Sumner, Dave Doyle, Roy Anderson, Dave Holland, and Alan Dragoo.



simultaneously to the receiver over the unknown point, as a result of which one can calculate the correct position of a point within the astounding accuracy of less than one-half inch, or one centimeter.

The Monticello survey monument will be established with differential GPS to an accuracy of one-half inch relative to the National Spatial Reference System of the United States. This historical survey will be done by David Holland, a licensed Virginia surveyor who is the county surveyor for Henrico County, Virginia; Dave Doyle, Senior Geodesist of the Federal Government's National Geodetic Survey Agency; Curt Sumner, licensed surveyor in Virginia and Maryland, and Executive Director of the American Congress on Surveying and Mapping; Alan Dragoo, licensed Maryland surveyor with Trimble Navigation, and Nancy Doyle and Roy Anderson, also with the National Geodetic Survey.

"This survey team has more than 100 years of experience," said Holland, beaming satisfaction mixed with pride on the Monticello GPS surveying party. "I'm not saying some of these guys are old," he added impishly, "but rumor has it Dave Doyle started surveying during the Coolidge administration and Curt Sumner was born and raised in a portion of Western Virginia that has yet to be discovered—with or without centimeter accuracy."

The uncertain ages of the various party surveyors notwithstanding, one thing is certain: the Lewis & Clark expedition monument at Monticello will be positioned with a precision that only the most recent technology can provide. Had they been alive today, Thomas Jefferson, Merriwether Lewis, and William Clark would have been extremely pleased with the technology revolution they helped initiate over 200 years ago. For more information concerning land surveying and GPS technology, check out the Internet at www.ngs.noaa.gov/; www.acsm.net; www.vasurveyors.org/.

WATCH THIS SPOT !!!